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A device and a method for the partial depositing of a surface coating and a breathing-active foil with a partial surface coating

The invention relates to a device and a method for depositing partial surface coatings onto a breathing-active, waterproof foil and to a foil with such a surface coating with the features of the preamble of the independent patent claims.

For manufacturing multi-layered sheet formations it is known on a substrate to depòsit a point-like surface coating of an adhesive. Subsequently the substrate is laminated with another foil. The foil is via the adhesive points connected to the substrate. Such sheet formations are for example applied as breathing-active textiles for clothing.

From CH 648 497 and CH 663 310 there are known methods and devices with which the partial surface coating is deposited with the screen printing method with the help of a rotating screening drum. With this known method and with this known device it is possible to manufacture two-layered sheet formations laminated on one side.

It is desirable not only to manufacture two-layered but also three-layered sheet formations. Thus for example with pieces of clothing it is advantageous when a middle, breathing-active foil may be laminated on both sides (i.e. with an outer layer and with a lining).

It is therefore the object of the present invention to provided a method and a device for depositing partial surface coatings on both sides of a foil so that the foil may be laminated on both sides. A further object of the invention lies in providing a

foil with a partial surface coating on both sides. A further object lies in providing a device for producing three-layered sheet material with an intermediate, breathing active layer in providing such material.

The surface coating on both sides should not compromise the breathing activity of the foil. Furthermore the textile feel of the foil in comparison with foils laminated on one side should not be worsened.

According to the invention these objects are achieved with a device and with a method as well as with a foil with the features and with a three-layered sheet material of the characterising part of the independent patent claims.

The device according to the invention for depositing a partial surface coating is based on the screen printing principle shown in CH 648 497 and CH 663 310. The contents of these publications are herewith expressly taken up into the contents of the present application. The device comprises at least one depositing device for the direct or indirect depositing of a flowable plastic mass onto the one side of the foil or onto a substrate. The first depositing device comprises preferably at least one depositing nozzle and a first movable screen. The movable screen is arranged between the depositing nozzle and the foil or between the depositing nozzle and the substrate. The first screen is synchronously movable with the foil or with the substrate.

With the indirect depositing the flowable plastic mass is first deposited onto a substrate, for example in the form of an endless tape or in the form of a cylinder and then transferred from the substrate onto the foil. Depositing nozzle in the context of

the present application is to be understood as any device for depositing the plastic mass.

For coating the other surface of the foil the device according to the invention comprises at least one second depositing device arranged on the other side of the foil. The second depositing device serves for the direct or indirect depositing of the flowable plastic mass onto the other side of the foil or onto another substrate. The first and the second depositing device are aligned or may be aligned to one another so that surface coatings on both sides of the foil are at least partly equal in overlapping. Preferably the device is used for producing a breathing active, water proof foil which is coated on both sides.

The second depositing device comprises preferably at least one second depositing nozzle and a second movable screen. The second movable screen is arranged between the second depositing nozzle and the foil or between the second depositing nozzle and the substrate. The second screen is movable synchronously to the first screen. Furthermore the first screen and the second screen are mutually alignable or aligned in the direction of the foil and/or in a direction transversely to the running direction of the foil. With the alignable arrangement of the first and of the second screen the partial surface coating may be deposited on the one side of the foil equal in overlapping with the partial surface coating on the other side of the foil. In this manner on both sides of the foil in each case coated or in each case uncoated surface sections are produced. The breathing activity of the foil coated on both sides is thus not compromised in comparison to the breathing activity of a foil coated only on one side. Likewise the feel of a 3-ply laminate with a middle foil according to the invention is considerably better than with a

foil with coatings, not equal in overlapping, of a foil coated on both sides or comparable to the feel of a foil coated only on one side. It is also conceivable to provide other depositing arrangements which permit a coating on both sides equal in overlapping. Instead of screens, e.g. gravure rollers may be used which serve the accommodation of the plastic material and which are mutually alignable.

In a particularly preferred embodiment example the first depositing device consists of a screen and the second depositing device functions according to the gravure principle. Typically on the one side there is provided a screen roller and on the other side an engraving roller. This arrangement is particularly advantageous with respect to the stability of the coating procedure. On account of the closed surface of the engraving roller this may serve well as a bearing roller. A further advantage with this arrangement lies in the fact that proceeding from the engraving roller as a pattern, in a simple manner a screen roller may be manufactured. By way of the fact that the screen roller is manufactured starting from the previously engraved engraving roller, it is ensured that the arrangement of the screen openings is arranged identically as the deepenings in the engraving roller. The engraving roller and the screen roller are mutually alignable in the previously described way and manner.

As a foil there is typically applied a breathing-active, water-impermeable foil, e.g. Goretex or Sympatex. Breathing-active and water-impermeable in this context means that the foil lets through water vapour to a certain extent and that the foil with normal use, e.g. as a piece of clothing, is waterproof.

In a preferred embodiment example of the invention the first and the second screen consist of screening drums which are rotatably mounted. The screening drums rotate in opposite directions.

However also a tape-like revolving screen is conceivable.

In a particularly preferred embodiment example the surface coating is directly dispensed from the screening drums onto the foil. The foil runs through between the two screening drums. With this the two screening drums are arranged such that their axes lie in a plane perpendicular to the foil. The screening drum on the one side of the foil thus simultaneously serves as a bearing roller for the other screening drum on the other side of the foil.

Advantageously the screening drums are mutually alignable in the direction of the axis as well as in the direction of the running of the foil. Futhermore also the axes of both the screening drums may be aligned such that they lie in one and the same plane.

The alignment of the screening drums in the running direction of the foil may be achieved by a suitable selection of the rotational speed of the drums. In operation the rotational speed of the two screening drums is equally large so that the two screens move synchronously to one another. For aligning the one screen with respect to the other screen (in the circumferential direction or the direction of running) the movement speed may be selected differently for so long until the screens are aligned to one another. In this context aligned means that the screen openings of the one screen at the moment of the depositing of the partial surface coating run equal in overlapping with the screen openings of the other screen.

The screen openings form typically a point grid. However also other arrangements, e.g. lines are conceivable.

In a particularly preferred further embodiment example the first and the second screen are designed identically. For example two identical screening drums may be applied. By way of the identical selection of the screen pattern it is ensured that a partial surface coating equal in overlapping may be produced on both surfaces of the foil. It would however also be conceivable with one screen to provide less screen openings than with the other screen, so that the two screens are not completely identical.

In the case of screening drums it is particularly advantageous to drive these with a servo-motor. The servo-motor permits the alignment of the two screens in the running direction of the foil.

The device comprises, arranged after the depositing devices in the running direction of the foil, arrangements for the lamination of the foil on both sides. Thereby a device for manufacturing sheet formations as a triple laminate is provided.

As a lamination for example tissue, woven material or fleeces are applied.

The method according to the invention, for depositing a partial surface coating on a foil, is particularly advantageous when using a device as is described above. However other devices are also conceivable. According to the invention on both sides of the foil a partial surface coating is deposited. The surface coatings on the two sides of the foil are with this deposited aligned to one another in a manner such that the foil has in each case on both sides coated and in each case on both sides

uncoated sections. The partial surface coating on the one side of the foil is thus at least partly equal in overlapping with the partial surface coating on the other side of the foil.

The foil according to the invention is advantageously manufactured with a device and with a method in the previously described form. However also other methods and devices for manufacturig such foils would be conceivable. The foil comprises on both sides a partial surface coating. According to the invention the surface coating of the first side is at least partly equal in overlapping to the surface coating of the second side. Thus on the foil in each case on both sides coated and in each case on both sides uncoated sections are formed. At least partly equal in overlapping in this context is to be understood in that for each coated section on the first side of the foil at the same location there is arranged a coated section on the second side of the foil. It however also may be the case that on the second side yet additional coated sections are present. This may be advantageous when on the one side of the foil more adhesive, for example more adhesive points, are desired than on the other side of the foil. It is also conceivable to form the points on the one side of the foil larger than the points on the other side of the foil.

The coating is with this preferably deposited point-like onto the foil. As a coating for example an adhesive of polyurethane is applied. Typically approx. 50 points are deposited per cm^2 of foil surface. The points have a surface of 0.8 mm^2 per point.

The invention is hereinafter explained in more detail in embodiment examples and by way of the drawings. There are shown:

Figure 1 a schematic representation of the device according to the invention,

Figure 2 an enlarged representation of the depositing device according to Figure 1,

Figures 3a to 3c various embodiment examples of the foil according to the invention,

Figure 4 a schematic representation of an alternative embodiment example of depositing devices,

Figure 5 an enlarged representation of a cut-out of the depositing devices according to Figures 1 and 2,

Figure 6 a plan view of two depositing devices according to Figures 1 or 2,

Figure 7 a schematic representation of a three-ply laminate according to the invention, and

Figure 8 an enlarged representation of a cut-out of an alternative embodiment example.

Fig. 1 shows a device 1 for the coating on both sides of a foil W with a flowable plastic mass K.

The foil W is led through in the running direction L about a deflection roller 8 and between two depositing devices 3a, 3b. The foil W is provided on both sides 4a, 4b with a coating 2a, 2b.

Subsequently the foil W is led via a stretcher bar 9 and supplied to a laminating arrangement 7.

The laminating arrangement 7 consists essentially of two calendars 10a, 10b. Via the calendars 10a, 10b from both sides of the foil W there is supplied a material Ma and Mb for laminating the foil W.

The flowable plastic mass K consists of an adhesive. The material Ma and Mb via the adhesive on both sides of the foil W in the laminating arrangement is connected to the foil W.

The foil W consists of a breathing-active, waterproof foil, for example Goretex or Sympatex. The materials Ma and Mb for the lamination are tissue, woven material or fleece, e.g. polyester tissue or fleece.

After the lamination in the laminating arrangement 7 the foil W is led as a three-ply laminate via a cooling table 14. The coatings 2a, 2b are as a partial surface coating deposited onto the sides 4a, 4b of the foil W. Typically the partial surface coating is formed as a point grid.

For depositing the point-like surface coating both depositing devices 3a, 3b have a screening drum 6a, 6b rotatably mounted about an axis A1 and A2 respectively. The plastic material K from the inside of the screening drum is deposited through the screen openings 11a, 11b (see Figure 2 and 5) onto both surfaces 4a, 4b of the foil W.

For depositing the plastic material K in the inside of the screen rollers 6a, 6b there is provided a depositing nozzle 5a, 5b and a doctor blade 23 on a doctor blade mounting 21. The doc-

tor blade mounting 21 may be heated. On account of the rotational movement of the screen rollers 6a, 6b and of the angle of the doctor blade 23 the plastic material enters through the screen opening.

Around the screen rollers 6a, 6b there is furthermore provided an infrared cover 20 for heating the screen rollers 6a, 6b. The infrared cover 20 is necessary so that the plastic material K remains in the pasty condition so that the material may be deposited through the screen openings 11a, 11b in the screening drums 6a, 6b onto the surfaces 4a, 4b of the foil W.

So that the surface coating 2a, 2b is equal in overlapping on both sides 4a, 4b of the foil W, the screening drums are aligned to one another.

The axes A1, A2 of the two screening drums 6a, 6b lie in one and the same plane E which runs perpendicularly to the foil W and perpendicularly to the running direction L of the foil W. The axes A1, A2 may where appropriate be designed adjustable so that the lie exactly in the plane E.

The rotation speed of the screen rollers 6a, 6b is furthermore adjustable so that the screen rollers 6a, 6b rotate synchronously to one another and synchronously to the foil W. The surface speed of the screening drums 6a, 6b corresponds to the speed with which the foil W is moved forwards.

The screening drums 6a, 6b are furthermore aligned in the axis direction A1, A2 and in the circumferential direction U1 and U2 so that the screen openings 11a, 11b in the two screening drums 6a, 6b are flush with one another. The plastic material K is liquified in the inside of the screening drum 6a, 6b and depos-

ited through the screen openings 11a, 11b onto the surfaces 4a, 4b of the foil W as partial surface coatings 2a, 2b.

In Figures 3a to 3c there are shown various embodiment forms of foils W coated according to the invention.

According to Figure 3a for each coated surface region 2a on the one side 4a of the foil W on the other side 4b at the same location there is formed an equally large coated surface region 2b. The pattern of the coating 2a on the one surface 4a is thus equal in overlapping with the pattern of the coating 2b on the other side 4b of the foil W.

In Figure 3b there is shown a foil W with which for each coated region 2b on the one side 4b, on the other side 4a there is formed a surface region 2a. On the side 4a there are furthermore formed yet further surface regions 2a.

In Figure 3c there is shown a foil W with which to each point 2a on the one side 4a there corresponds a point 2b on the other side 4b. The size of the points 2a and 2b is however different.

With the term essentially equal in overlapping in the following application each of the embodiment examples 3a to 3c are included.

In Figure 4 there is shown an alternative embodiment of the device according to the invention. Instead of the fact that as according to Figure 1 the partial surface coating 2a, 2b is directly deposited from a screening drum 6a, 6b onto the foil W, in Figure 4 there is provided a substrate Ta, Tb. The plastic material K in a point grid is added onto the surface of the substrate Ta, Tb and from this is deposited onto the foil W. The

substrates Ta, Tb are designed as rollers. The rotational speed of the screening drums 6a, 6b and of the rollers Ta, Tb are synchronous to one another and synchronous to the speed of the foil W. In that the screening drums 6a, 6b are aligned to one another, there is effected an indirect deposition of partial surface coatings which are aligned to one another, i.e. are essentially equal in overlapping on both sides 4a, 4b.

Of course instead of a substrate Ta, Tb in the form of a roller also a tape-like substrate as described in CH 648 497 or CH 663 310 may be applied.

In Figure 5 there is shown an enlarged representation of the screening drums 6a, 6b according to Figure 2 in the region of the deposition of the plastic material K onto the foil W. The screen openings 11a, 11b of the screening drums 6a, 6b are flush with one another in this region. The plastic material K is thus deposited equal in overlapping on the upper side 4a and on the lower side 4b.

For adjusting the circumferential speed of the screening drums 6a, 6b a motor is driven correspondingly quickly. For aligning the screen openings 11a, 11b in the circumferential direction U1, U2 the one screening drum 6a is moved faster than the other screening drum 6b for so long until the screen openings 11a, 11b are flush with one another. Thereafter the screening drums are rotated further with the same circumferential speed. The alignment may be effected visually (i.e. by observation of an operating person). The screening drums may for this be also provided with reference markings on their surface. It is also conceivable to provide reference markings which are automatically detectable (e.g. via optical electronics).

In Figure 6 there is shown schematically a plan view of the two screening drums 6a, 6b. The screening drums 6a, 6b are mounted rotatably about axes A1, A2. On the left edge of the screening drum 6a, 6b schematically there are shown screen openings 11a, 11b. The screen openings 11a of the one drum 6a are aligned with respect to the screen openings 11b of the other screening drum 6b and lie in one and the same plane running perpendicularly to the axis A. Subsequent to the represented screen openings 11a, 11b there follow further (not shown) screen openings 11a, 11b which are arranged in planes 12 running perpendicularly to the axes A1, A2.

The screening drums 6a, 6b are designed identically. In particular on both screening drums 6a, 6b there are arranged an equal number of screen openings 11a, 11b with equal distances.

So that the screen openings 11a of the one screening drum 6a lie in the same plane 12 as the screen openings 11b of the other screening drum 6b the screening drums 6a, 6b are displaceable along the axes A1, A2. The displacement may be effected manually or motorically.

In Figure 7 there is shown a sheet formation G according to the invention which is designed as a three-ply laminate. The foil W according to the invention forms a middle layer. On the one side 4a of the foil W there is laminated a first material Ma. On the second side 4b of the foil W there is laminated a second material Mb. The material Ma, Mb consists of a tissue, a woven material or a fleece which via the partial surface coating 2a, 2b in the form of points is connected to the foil W formed of a foil material. Because the surface coatings 2a, 2b on the surfaces 4a, 4b are aligned to one another, moisture H may pass unhin-

dered through intermediate spaces between the surface coatings 2a and 2b.

In Figure 8 there is shown an enlarged cut-out of a foil running through between two deposition mechanisms of an alternative embodiment example. The first depositing mechanism 3a is designed in the previously described form and consists essentially of a screening drum 6a by way of which the plastic mass K may be deposited onto the side 4a of the foil W.

In contrast to the previously described embodiment examples the second depositing device 33 is designed with an engraving roller 36. The engraving roller 36 comprises deepenings 35 which are distributed with the same pattern over the surface of the engraving roller 36 as the screen openings 11 of the screening drum 6a.

The engraving roller 36 is led through a bath which contains the plastic material K. With a doctor blade 34 the plastic material is doctored from the surface of the engraving roller so that the plastic material K only still remains in the deepenings 35. From the deepenings 35 the plastic material by contact is deposited onto the surface 4b of the foil W.

In contrast to screen openings 11 the deepenings 35 form a clearly defined counter bearing surface for the screening drum 6a. A stable operation is possible therewith.